On Books

The Foundations of Radical Behaviorism As a Philosophy of Science: A Review of *Radical Behaviorism: The Philosophy and the Science* by M. Chiesa

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B. F. Skinner began his article "Behaviorism at Fifty" (Skinner, 1964) as follows:

Behaviorism, with an accent on the last syllable, is not the scientific study of behavior but a philosophy of science concerned with the subject matter and methods of psychology. (p. 79)

Readers are indeed fortunate that a large number of superb books have been published in the last few years, laying out just what that philosophy is. To that growing list may now be added another.

Many individuals seem to regard the philosophy of science that is radical behaviorism in something like the following way. The passage below is taken from an interview with Skinner's Harvard colleague, George Miller, and appears in a book by Baars (1985):

Herb Jenkins once explained to me the attraction of Skinnerian psychology to a graduate student. He said, "You know, you can learn Skinnerian psychology very quickly: The first day you are there, you learn that statistics is no damn good. Bang! like that. I don't have to worry about *that*. The next day you learn physiological psychology is no damn good. Bang! just like that. You don't have to worry about it. The third day you learn the history of psychology is no damn good. Bang! just like that,

you've handled that. You go down any road until you come to Fred Skinner, and that's where psychology starts. It's really like that!" (p. 206)

Not having any firsthand experience with the Harvard department, I cannot speak for those who do, but I would be surprised if it was "really like that."

Chiesa's book is an important contribution to the radical behaviorist literature. The book provides the foundation of radical behaviorism as a coherent and integrated philosophy of science, and not just the idiosyncratic position of a controversial behavioral scientist. The general plan of the book is to show how radical behaviorism lies at the end of particular, systematic trends of thought on several interrelated issues. The origins of those trends are presented, and the origins of the trends that constitute traditional psychology are also presented as a contrast.

The present book is an outgrowth of the author's dissertation work at University of Wales, College of Cardiff, under her adviser, Derek Blackman. Several of the themes were extracted and presented in the special issue on Skinner's work in the *American Psychologist* (Chiesa, 1992), and the full treatment is available in the text. I would like to first review the contents of the book, and then discuss what I think is its most important point, the nature of causal explanation according to radical behaviorism.

THE TEXT

Overview

The book consists of nine chapters. Chapter 1 is an introductory chapter. The meat of the book is in the next eight chapters. Chapter 2 concerns language. Chapter 3 concerns the aims and methods of science. Chapter 4 concerns methods of dealing with variation and individuality. Chapter 5 is on concepts of causation. Chapter 6 deals with concepts of description, explanation, and theory. Chapter 7 examines mechanistic thinking in psychology. Chapter 8 compares radical behaviorism with traditional forms of behaviorism. Finally, chapter 9 concludes by advocating a more relational approach to science and scientific knowledge, so that science can be used to improve the human condition.

Chapter 2: Ordinary
Language and Science

This chapter addresses some of the pitfalls associated with the uncritical use of ordinary language in the scientific domain. For example, Hineline (1980, 1990, 1992) has pointed out the inherent clash between cultural norms and behavior-analytic explanatory language. The norm in our western culture is decidedly mentalistic, if not dualistic, in that most individuals seek to explain the behavior of other individuals by appealing to personal, agent-oriented causes. According to traditional social psychologists, this practice involves making *dispositional attributions*. Indeed, traditional social psychologists feel that a bias exists, called the *fundamental attribution error,* whereby individuals favor this mode of explanation. Interestingly, this way of describing the situation may itself be regarded as illustrating the fundamental attribution error, in that some dispositional factor (a bias) is identified as being responsible for the behavioral tendency to make dispositional attributions (e.g., Hineline, 1992, p. 1278). The English language seems an es-

pecially congenial vehicle in which to frame such locutions.

In any case, radical behaviorists reject the personal, agent-oriented dispositional attributions that much of contemporary culture accepts as explanatory. In so doing, of course, it expresses its own causal account in language that runs decidedly against the grain of cultural explanatory practices. Behavior analysts advocate instead a much more interactive, relational approach, without any appeal to a causal effect of dispositions. When behavior analysts warn that much effort is being devoted to looking for things that aren't there, such as the elements of dispositional approaches, behavior analysis is often dismissed as some arcane, stylistic preference for observables. The behavior-analytic view is that practitioners of any kind of behavioral science need to be aware of the effects of language and our cultural traditions. Ordinary language can inadvertently influence our discriminative categories, mischievously deflecting our scientific attention.

Chapter 3: Science:
Aims and Methods

Chapter 3 examines methods in science. A good deal of this chapter is drawn from the work of Laudan (1977, 1984), who is both a philosopher and a historian of the philosophy of science. Chiesa argues that the formal hypothetico-deductive method, which is dominant in traditional psychology, does not always achieve the ends it says it does. Theories and hypotheses are often of limited scope. Experiments conducted to evaluate them are often of limited value, and they are often wasteful.

From the perspective of radical behaviorism, knowledge (whether produced by laboratory research or otherwise) is a behavioral rather than a logical phenomenon. Such knowledge needs to be understood in terms of contingencies. Syllogisms and other logical artifices are valuable because they

yield verbal stimuli that exert discriminative control, not because they bestow some otherwise unattainable ontological or epistemological validity on the knowledge claim.

Chapter 4: Aims, Methods, and the Individual

What then do behavioral scientists do about the variability created by the consideration of individual cases? From the view of traditional psychology, some instances of variation are simply undesirable effects of errors in measurement. Other instances of variation simply indicate individual differences of unknown origin. In any event, on the traditional view, the variation can be overcome by imposing a statistical model of analysis. Instead of considering the individual case, one considers the average, and then infers how likely a given observation is on the basis of the random sampling distribution of some test statistic.

Chiesa points out that as sophisticated as these statistical techniques are, they miss the point. The average case and the normal curve simply document that variation is the rule in nature, not an undesirable nuisance to be circumvented. The interventions of a behavioral science still have to be applied to the individual case. Aggregating data from a group of subjects in a statistical analysis may well obscure important sources of variability, thereby leading to incorrect interpretations of behavioral processes.

Moreover, an embrace of formal methods relying on statistical inference buttresses the earlier conclusion that knowledge claims are essentially logical rather than psychological phenomena. That is, inferential statistics are thought to somehow lend logical assurance that results are significant, in the sense that they would occur only 5% of the time through chance. In addition, significant results are sometimes used to claim validity for the operation of some causal phenomenon from another dimension.

For radical behaviorists, claims of statistical significance are often mischievous. A relation of statistical significance may well exist between say, experimental and control groups of randomly selected subjects, but what of behavioral significance? What is the size of the behavioral effect? Of what practical importance is the size of the behavioral effect? None of these issues is meaningfully engaged by methods concerned with the formalities of hypothesis testing and inferential statistics.

Chapter 5: Concepts of Causation

The position that human behavior is an expression of something else, operating in some other dimension, dominates western culture. Chiesa effectively challenges this position by critically examining the thesis of determinism, the notion of causation in science generally, and the notion of causation in radical behaviorism particularly.

Citing Grunbaum's arguments against indeterminacy, Chiesa suggests that individuality, complexity, and purpose are inadequate reasons to reject the thesis that human behavior is subject to the causal laws of science. However, the precise nature of those causal laws needs to be carefully elaborated. Although past positions on causation have appealed to mechanical notions of causation, in which various elements serve the function of links in a causal chain, contemporary positions have rejected this position in favor of a more relativistic one. Radical behaviorism embraces a causal mode that does not require links between one event and another. That mode does not require contiguity in time or space. The functional relations advocated by radical behaviorism are statements of dependency and interrelation, rather than statements of powers, forces, and linear mechanical relations.

Chapter 6: Interpretive Techniques and Explanatory Theories

Skinner is well known for his attack on traditional theories of learning (Skinner, 1950). When he objected to "any explanation of observed fact which appeals to events taking place somewhere else, at some other level of observation, described in different terms, and measured, if at all, in different dimensions" (Skinner, 1950, p. 193), Chiesa points out that he was following Mach. Mach opposed certain kinds of theories, specifically those mechanistic theories that appealed to hypothetical entities to fill the temporal and spatial gaps between functionally interrelated events. The problem with such theories, as the history of learning theory in behaviorism clearly shows, is that the hypothetical constructs within the system, rather than the functional relations themselves, become the focus of attention. Skinner was simply passing this same message to psychologists. Chiesa emphasizes that scientists must recognize when they are not dealing with actual events, but instead are seeking to interpret natural phenomena as mechanical systems and to describe the world as a great machine whose functioning can be understood by identifying each of its parts.

Chapter 7: Mechanistic Thinking in Psychology

In this chapter, Chiesa points out that two examples of mechanistic thinking seem to predominate in psychology: (a) explanations couched in physiological terms and (b) explanations couched in mentalistic terms. To be sure, physiological information is useful, but a physiological account does not take precedence over a behavioral account. Each is important, and each makes it own contribution to a science of behavior.

Mentalistic accounts typically follow the traditional pattern of locating causes of behavior inside the organism. From Freud's id, ego, and superego to the memory structures of contemporary cognitive psychologists, mentalistic explanatory entities seem merely to satisfy the requirements of mechanistic causality by filling the spatial and temporal gaps between the stimulating environment and behavior. Unfortunately, they are often vacuous, in that they often do not provide any practical clue to the social worker, educational psychologist, or clinical psychologist as to how to improve the human condition.

Chapter 8: Behaviorism and Radical Behaviorism

The history of behaviorism yields important insights into the contemporary scene. Pavlov believed himself to be a brain physiologist investigating cortical activity under various patterns of stimulation. He happened to use as evidence responses that were elicited by specific stimuli. He showed orderly relations between behavior and environmental events, but that does not mean that Pavlov is Skinner's direct ancestor. Watson also formulated his important relations in terms of eliciting stimuli and elicited responses. Although Watson dispensed with a dualistic view of the human individual, Watson's stimulus–response (S-R) system is not a direct ancestor of Skinner's system either.

When the S-R psychology of Pavlov and Watson proved inadequate, psychologists embraced mediational stimulus–organism–response (S-O-R) neobehaviorism. Tolman and Hull may be regarded as prime exemplars. Mediational neobehaviorists filled the spatial and temporal gaps between stimulus and response with mediating organismic variables. These variables were hypothetical in nature, and became designated as *theoretical* entities. Although Tolman and Hull appealed to different kinds of theoretical entities to fill those gaps, they both displayed a mechanistic orientation by virtue of their thinking that filling the gaps was a necessary part of psychological theorizing.

Chiesa points out that Skinner's system is entirely different. First, it takes the mutual relation between behavior and environment as its subject matter. Second, it is not mechanistic, so it does not appeal to mediating entities or events. Third, it regards complex behavior as a function of complex contingencies rather than as internal states of the organism. Fourth, it dispenses with dualistic interpretations of private events, and argues in favor of a thoroughgoing behaviorism, where private events are accommodated at the behavioral level. Any link with Pavlov, Watson, Tolman, or Hull is useful only in a historical context, to identify a shift away from the introspective study of the contents of consciousness and toward the study of behavior as an interactive, adaptive process.

Chapter 9: Concluding Remarks

Why is the material in the prior chapters so vitally important? A critical examination of traditional practices reveals that they are based on an entire series of incorrect assumptions about the nature of verbal behavior, the role of verbal behavior in producing knowledge, and the role of theories in knowledge and explanation. These incorrect assumptions ultimately lead people to search for the wrong causes of behavior, and to accept incorrect answers about the nature of those causes. That is, radical behaviorists argue that traditional approaches obscure important details, they allay curiosity by getting us to accept fictitious way stations as explanatory, they impede the search for genuinely relevant variables, they misrepresent the facts to be accounted for, and they give us false assurances about the state of our knowledge. Moreover, they lead to the continued use of scientific techniques that should be abandoned (e.g., because they are wasteful). Thus, the objection is on pragmatic grounds: Traditional approaches interfere with the effective prediction, control, and explanation of behavior.

Chiesa suggests that, ultimately, nothing less than the future of humanity is at stake. The bad news is that our world is threatened by war, famine, pollution, rising birth rates, the depletion of natural resources, and no doubt other calamities too frightful to contemplate. The good news is that by changing our behavior, such problems can be reduced, if not eliminated. Fortunately, we have the means to change behavior, if only the social and cultural impediments to using that technology can be overcome. An important step in overcoming these impediments is to recognize that because of its relational rather than mechanistic approach, radical behaviorism provides the most stable and coherent position in contemporary psychology.

RADICAL BEHAVIORISM AND THE NATURE OF CAUSAL EXPLANATION

Description and Explanation

Traditionally, psychologists seem to have approached the matter of causal explanation as follows (e.g., Flanagan, 1984, pp. 182–183):
1. Start with known, publicly observable facts.
2. Ask how the facts could come to be as they are.
3. Appeal to publicly observable phenomena to answer the questions from Step 2. If all questions are answered satisfactorily in terms of observable phenomena, stop. If some questions remain unanswered, proceed to Step 4.
4. Appeal to unobservable powers or forces, entities, mechanisms, or events to answer the remaining questions.

As Chiesa has noted, a quick review of the history of psychology suggests that the appeal to publicly observable S-R mechanisms in classical behaviorism left many questions unanswered. Psychologists then set about postulating unobservable phenomena according to the S-O-R model of mediational neobehaviorism. The tricky part was to

make the Step 4 answers valid and meaningful according to some set of logical or mathematical principles. As alluded to earlier, this effort carries with it a whole package of assumptions about the nature of language and what must occur for language appealing to the unobservable phenomena in the explanation to be considered valid and meaningful.

As Chiesa expertly lays out, the explanatory posture of radical behaviorism is entirely different. Skinner drew much of his posture on explanation from Mach. Mach was a physicist and mathematician who was concerned with the proliferation of unseen entities of uncertain origin. Therein lies the comparison with psychology, which was also concerned with its own proliferation of unseen entities of uncertain origin. Mach suggested that the starting point for explanations is description. For radical behaviorists, description is concerned with coming under the stimulus control of events and properties of events in the environment. Descriptions extend gradually to statements that relate uniformities and regularities between classes of properties. That is, descriptions gradually become statements of functional relations that integrate and summarize those relations in economical terms. Explanation consists in the expression of these functional relations in integrated and economical terms.

This posture is likely to be seen as quite odd by those who operate from the traditional perspective that the proper role of explanation is to postulate unobservable phenomena. Indeed, it is odd, according to the traditional perspective. The traditional perspective is mechanistic, and requires gaps to be filled by contiguous, mediating phenomena. That is where the difference lies, and that is perhaps the principal reason why radical behaviorism does not enjoy widespread acceptance as a philosophy of science.

Theory

Consider the term *theory*. Traditionally, the term is often taken to mean a speculation about unobservable powers, forces, entities, mechanisms, or events that needs to be subjected to experimental test, which would confirm or falsify it. For radical behaviorists, a theory is a system of explanations that describes regularities, expresses uniformities, integrates findings into general classes of conclusions, and states general principles. Theories are not regarded as wholly speculative statements, such that they need to be confirmed by experimentation. Rather, theories are derived from observations made during experiments. Speculation, curiosity, and so on are surely important, but they are important more at the level of the experiment than at the level of the theory. Thus, Skinner (1972) could say

[a theory] has nothing to do with the presence or absence of experimental confirmation. Facts and theories do not stand in opposition to each other. The relation, rather, is this: theories are based on facts; they are statements about organizations of facts. . . . Whether particular experimental psychologists like it or not, experimental psychology is properly and inevitably committed to the construction of a theory of behavior. A theory is essential to the scientific understanding of behavior as a subject matter. (p. 302)

This position emphasizes the pragmatic orientation of radical behaviorism. Theories are important because of their discriminative function, that is, because of how they guide future behavior and enable individuals to interact effectively with nature. Theories are verbal products, and may be understood in terms of the processes that have produced them. The important question, then, is what exerts stimulus control over the artifact of verbal behavior called a theory, and how this control arose.

On this view, some theories are concerned with essentially structural issues, such as the relation between components of an established repertoire. Trait theories are one example. Such theories are undeniably valuable. If one knows how the parts of a repertoire are related, then one can act effectively or predict (which, after all, is behavior as well) on the basis of knowing one part.

Such theories are effect-to-effect statements. However, as Skinner (1953) noted,

a trait or factor is derived from the observation of the dependent variable only. This limitation is not changed by any mathematical operation. A fairly exhaustive set of tests may enable us to evaluate traits and to predict performances in a wide range of situations, but the prediction is still from effect to effect. The mathematical refinement has not brought the trait under control. We do not change behavior by manipulating a trait. (p. 203)

In contrast, other theories are concerned with cause-to-effect relations. If the interest is in developing a science that is concerned with the control of behavior—with the manipulation of behavior to produce some end—then these statements are the most directly relevant. They are concerned with fundamental processes, not merely correlations among dependent variables. The fundamental processes, expressed in the form of functional relations, can be controlled. One is not left with effect-to-effect relations, whose causes are not identified and therefore cannot be controlled.

Prediction

Where does this position lead us in regard to prediction? The traditional position on prediction comes from the widely accepted Hempel-Oppenheim "covering law" model of explanation. According to this law, explanations are considered to be conclusions, or deductions, in a logical argument in which some generalized covering law is proposed and some statement of antecedent conditions, such as the result of an experiment, is given. The results are said to be "explained" when the empirical phenomenon in question is regarded as a logical deduction from the argument. Explanation and prediction are regarded as symmetrical activities, differentiated by the tense of the verb that is used in the statement of the antecedent condition. If the past tense is used, the statement is an explanation. If the future tense is used, the statement is a prediction.

In contrast, for radical behaviorism, prediction is a verbal activity rather than a property of a logical explanatory system. Prediction is simply verbal behavior, emitted under the stimulus control of certain factors. As factors that participate in a functional relation come to be identified, those factors can participate in the stimulus control over the prediction. As more factors are identified, the prediction will become more accurate. Neither explanation nor prediction is treated as a logical phenomenon. Day (1969) raised similar points some years ago:

The issue here is whether explanations and predictions are properties of scientific systems themselves or whether they are aspects of human functioning. Are predictions about what is to be observed properties of formally organized words and symbols or are they varieties of human behavior? . . . For Skinner, the preference is to view explanations and predictions as aspects of human behavior. Their nature can be understood only after examining the variety of factors controlling usage of the words "explanation" and "prediction." To raise questions concerning how a particular explanation happens to have been given is to inquire about the behavior of the person offering the explanation. To raise questions concerning how predictions happen to be made is to inquire about the behavior of making a prediction. To raise questions concerning how predictions *should* be given is to invite behavioral control in the form of advice. To raise questions concerning the adequacy of an explanation is to inquire about the effects of the explanation upon the behavior of persons who entertain the explanation. (p. 504)

At the very least, consider the nature of covering law explanations. For the traditional Hempel-Oppenheim model to hold, the covering law must be true. However, in most cases, the investigation is undertaken precisely to determine whether the covering law is true. Surely it is a strange form of reasoning to assume some law is true and then say that an event has been explained or predicted when it is deduced from that assumption!

SUMMARY AND CONCLUSION

One of the criteria for the ABA accreditation of graduate programs is a curriculum topic in conceptual issues. With the numerous suitable books now

available, behavior analysts might well begin to explore teaching such a course in several different ways, with several different books, and share their experiences. No doubt some of the success or failure of teaching about radical behaviorism is related to the entering repertoires of the students rather than to the books per se. In any case, I see the present book as making an important contribution to a course in conceptual issues. In sum, Chiesa's book provides the background on the principles underlying radical behaviorism, as well as reasons for why those principles are important. We are fortunate to have it available to us.

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